

WHAT IS CLAIMED IS:

1 1. A method for treating a target region in tissue at or beneath a tissue
2 surface, said method comprising:
3 deploying a first array of electrodes in the tissue at the target region;
4 deploying a second electrode on the tissue surface over the target region;
5 and
6 applying electrical current to the tissue through the electrodes.

1 2. A method for treating a target region in tissue at or beneath a tissue
2 surface, said method comprising:
3 deploying a first array of electrodes in the tissue at the target region;
4 deploying a cover over the tissue surface over the target region, wherein
5 the first array and cover are drawn together to apply compression on tissue in the target
6 region; and
7 applying electrical current to tissue in the target region through the first
8 array of electrodes.

1 3. A method for treating a target region in tissue at or beneath a tissue
2 surface, said method comprising:
3 deploying a first array of electrodes in the tissue at the target region;
4 deploying a cover over the tissue surface over the target region, wherein
5 the cover is configured to electrically and thermally isolate the target region and first
6 electrode array from external tissue structures adjacent to the target region; and
7 applying electrical current to tissue in the target region through the first
8 array of electrodes.

1 4. A method as in any of claims 1, 2, or 3, wherein deploying the first
2 array of electrodes comprises:
3 positioning a probe so that a portion of the probe is near the target region
4 in the tissue; and
5 advancing a plurality of at least three array electrodes radially outwardly
6 from the probe to define the first electrode array.

1 5. A method as in claim 4, wherein the probe is advanced directly into
2 tissue with the array electrodes retracted within the probe.

1 6. A method as in claim 4, wherein a combination of probe and stylet
2 is initially advanced into the tissue, and wherein the stylet is withdrawn from the probe
3 prior to advancing the array electrodes through the probe.

1 7. A method as in claim 4, wherein advancing the array electrodes
2 comprises advancing them forwardly from a distal end of the probe so that the electrodes
3 evert outwardly as they are advanced into the tissue.

1 8. A method as in claim 4, wherein the array electrodes deploy
2 outwardly to a radius from 0.5 cm to 3 cm wherein fully distally extended.

1 9. A method as in any of claims 1, 2, or 3, wherein the first array
2 electrodes are deployed at a depth below the tissue surface in the range from 2 cm to
3 10 cm.

1 10. A method as in claim 1, wherein deploying the second electrode
2 comprises engaging a plate electrode against the tissue surface.

1 11. A method as in claim 10, wherein the plate electrode has an area in
2 the range from 2 cm² to 10 cm².

1 12. A method as in claim 1, wherein deploying the second electrode
2 comprises penetrating a plurality of tissue-penetrating electrode elements through the
3 tissue surface.

1 13. A method as in claim 12, wherein the plurality of tissue-penetrating
2 electrode elements are penetrated over an area in the range from 2 cm² to 10 cm².

1 14. A method as in claim 13, wherein the electrode elements are
2 penetrated to a depth in the range from 3 mm to 10 mm.

1 15. A method as in claim 12, wherein the tissue-penetrating electrode
2 elements are pins having a diameter in the range from 1 mm to 3 mm and a depth from
3 the electrode face in the range from 3 mm to 10 mm.

1 16. A method as in claim 4, further comprising removably attaching
2 the second electrode to the probe after the array electrodes have been advanced.

1 17. A method as in claim 1, wherein high frequency current is applied
2 simultaneously through both the array electrodes and the second electrode attached to a
3 common pole of a power supply in a monopolar mode.

1 18. A method as in claim 1, wherein high frequency current is applied
2 with one pole attached to the array electrodes and another pole attached to the second
3 electrode in a bipolar fashion.

1 19. A method as in claim 1, wherein the high frequency current is
2 applied successively from the electrodes in a monopolar mode.

1 20. A method as in claim 2, wherein the high frequency current is
2 applied first through the first array of electrodes to necrose tissue at or near a boundary of
3 the target region to inhibit blood flow into the target region.

1 21. A method as in claim 2 or 3, wherein the cover comprises a rigid
2 plate.

1 22. A method as in claim 2 or 3, wherein the cover comprises a
2 conformable surface.

1 23. A method as in claim 2 or 3, wherein the cover is composed of an
2 electrically non-conductive material.

1 24. A method as in claim 2 or 3, wherein the cover and first electrode
2 array are drawn together with a force of at least 0.5 psi.

1 25. A method as in claim 2 or 3, wherein deploying the first electrode
2 array comprises positioning a probe so that a portion of the probe lies near the target
3 region and deploying the cover comprises securing the cover to the probe after the probe
4 has been deployed.

1 26. A method for heat-mediated necrosis of a target region in tissue,
2 said method comprising:
3 inhibiting blood flow into the target region, wherein inhibiting comprises
4 creating a blood flow barrier across a tissue boundary or throughout the target region; and

heating the tissue within the target region for a time and of a power level sufficient to necrose said tissue, wherein blood flow inhibition reduces the amount of energy required to heat the tissue.

27. A method as in claim 26, wherein inhibiting blood flow comprises heating the tissue at or near a distal boundary of the target region to at least partially block the vasculature leading into and out of the target region.

28. A method as in claim 27, wherein the inhibiting step comprises deploying an electrode array proximal the distal boundary and delivering high frequency energy from the array into the tissue.

29. A method as in claim 28, wherein heating of the target region comprises engaging a second electrode against an area of tissue overlying the target region and delivering high frequency energy from the electrode to the target region.

30. A method as in claim 29, wherein the electrode array and the second electrode are deployed to compress tissue therebetween and further inhibit blood flow into the target region.

31. A method as in claim 26, wherein inhibiting blood flow comprises compressing tissue within the target region sufficiently to reduce blood flow therethrough.

32. A system for treating a target region in tissue beneath a tissue surface, said system comprising:
a probe having a distal end adapted to be positioned beneath the tissue surface to a site in the tissue;
a plurality of electrodes deployable from the distal end of the probe to span a region of tissue proximate the target region; and
a cover removably attachable to the probe and adapted to span an area of the tissue surface over the target region.

33. A system as in claim 32, wherein the cover has a generally flat face.

1 44. A system as in claim 36, wherein the surface electrode is adapted
2 to mechanically couple to the probe, wherein the plurality of electrodes remain
3 electrically isolated from the surface electrode for bipolar operation.

1 45. A system as in claim 32, wherein the probe comprises:
2 a cannula having a proximal end, a distal end, and a lumen extending to at
3 least the distal end, and wherein the plurality of electrodes are resilient and disposed in
4 the cannula lumen to reciprocate between a proximally retracted position wherein all
5 electrodes are radially constrained within the lumen and a distally extended position
6 wherein all electrodes deploy radially outwardly, said plurality including at least three
7 electrodes.

1 46. A system as in claim 45, wherein at least some of the electrodes are
2 shaped so that they assume an outwardly everted configuration as they are extended
3 distally into tissue from the distal end of the cannula.

1 47. A system as in claim 45, further comprising a rod structure
2 reciprocatably received in cannula lumen, wherein the electrodes are secured at a distal
3 end of the rod in an equally spaced-apart pattern.

1 48. A system as in claim 45, wherein the cannula has a tissue-
2 penetrating member at its distal end to permit advancement of the cannula through tissue.

1 49. A system as in claim 45, further comprising a stylet reciprocatably
2 received in the cannula lumen, wherein the stylet may be used for initially positioning the
3 cannula in tissue and thereafter exchanged with the electrodes.

1 50. A system as in claim 45, wherein the cannula has a length in the
2 range from 5 cm to 30 cm and an outer diameter in the range from 1 mm to 5 mm.

1 51. A system as in claim 45, wherein the electrodes deploy outwardly
2 to a radius in the range from 0.5 cm to 3 cm when fully distally extended from the
3 cannula.

1 52. A system as in claim 45, wherein the plurality includes at least five
2 electrodes.

- 1 53. A system as in claim 45, wherein the plurality includes at least
2 eight electrodes.
- 1 54. A system as in claim 45, wherein the plurality includes at least ten
2 electrodes.
- 1 55. A system as in claim 36, wherein the active areas of the first
2 electrode array and the second electrode are approximately equal and the first electrode
3 array and second electrode are electrically isolated.
- 1 56. A surface electrode comprising:
2 a support structure attachable to an elongate probe and having an area in
3 the range from 2 cm^2 to 10 cm^2 ;
4 4 to 16 tissue-penetrating pin electrodes projecting from the support
5 structure and having a length in the range from 3 mm to 10 mm and a diameter in the
6 range from 1 mm to 3 mm.
- 1 57. A kit comprising:
2 an electrode or cover adapted to be engaged against a tissue surface; and
3 instructions for treating a target region in tissue using the electrode in
4 combination with an electrode array according to any of claims 1, 2, or 3.
- 1 58. A kit as in claim 57, further comprising the electrode array.
- 1 59. In a method for applying high frequency electrical energy to tissue
2 a target region beneath a tissue surface, an improvement comprising compressing the
3 target region sufficiently to inhibit blood flow therethrough while high frequency
4 electrical energy is being applied.
- 1 60. A method as in claim 59, wherein the target region is compressed
2 between a first array of electrodes beneath the tissue surface and a cover or second
3 electrode on the tissue surface.
- 1 61. A method as in claim 59, wherein the target region is compressed
2 between a pair of spaced-apart structures which are both penetrated into the tissue.

1 62. A method for positioning an electrode array beneath a tissue
2 surface, said method comprising:
3 determining a target depth;
4 positioning a cover on a tissue-penetrating probe so that an array
5 deployment location on the probe is located away from the cover by a distance
6 corresponding to the target depth;
7 penetrating the probe into tissue until the cover engages the tissue surface;
8 and
9 deploying the electrode array from the deployment location.